

Civil Engineering

In the College of Engineering

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The undergraduate degree in Civil Engineering is accredited by the Accreditation Board for Engineering and Technology, Inc.

Faculty

Emeritus: Johnson, Krishnamoorthy, McGhie, Noorany, Stone
Chair: Supernak

Professors: Banks, Chang, Chou, Ponce, Supernak, Westermo

Associate Professors: Bayasi, Sharabi

Offered by the Department of Civil and Environmental Engineering

Doctor of Philosophy degree in engineering sciences/applied mechanics.

Master of Science degree in civil engineering.

Concentration in environmental engineering.

Major in civil engineering with the B.S. degree.

Mission of the Department

The mission of the Department of Civil and Environmental Engineering is to provide a high quality undergraduate and graduate education in the civil and environmental engineering areas as well as the advising and other support needed to ensure the students' academic success and preparation for a productive engineering career. In addition, through research and continuing professional development, the faculty produce, enhance and promote new developments within their areas of expertise for the benefit of society and the furtherance of their profession.

The objective of the program is to give the student a basic knowledge of civil and environmental engineering, as well as the interdisciplinary background and skills to meaningfully participate in and contribute technical advances toward this profession. The program integrates technical aspects with studies in the social sciences and humanities to ensure appropriate sensitivity to socially related problems.

Instruction is given both at the undergraduate level, leading to the bachelor's degree, and at the graduate level, leading to the master's or doctoral degrees. The undergraduate program builds upon concepts of mathematics, physics, chemistry and basic engineering with specialized study in civil and environmental engineering. Engineering design is emphasized, particularly in conjunction with computer utilization and practical civil and environmental engineering problems. Aspects of safety and engineering ethics are woven throughout the program. Breadth and depth of social science and humanities studies is assured by department approved courses. Completion of the undergraduate degree prepares the student for an entry-level professional position in addition to informal or formal graduate studies.

Many students who complete the civil or the environmental undergraduate program choose to continue their formal studies on a full or part-time basis at San Diego State University or at another institution. (See the *Bulletin of the Graduate Division* for additional information.) The objective of the graduate program is to broaden the student's technical competence and design abilities and allow for additional specialization.

The civil and environmental engineering program is enhanced through cooperation with the American Society of Civil Engineers, the American Public Works Association, the Associated General Contractors, the Chi Epsilon Civil Engineering Honor Society, and other national organizations who sponsor student chapters to further aid the student's professional development. The chapters at San Diego State

University have won many awards in regional and national competition with other schools throughout the country.

Educational Objectives

The objectives of the program are to prepare graduates to practice civil engineering in the areas of structures, geotechnical, water resources, transportation, environmental, and construction by providing them with the ability to apply the basic principles of the mathematical, physical, and social sciences to the analysis and solution of civil engineering problems including the design of civil engineering projects; to provide a basic understanding of issues faced during professional practice and a solid foundation for continuing education and graduate study.

Transfer Credit

No credit will be given for upper division engineering coursework taken at an institution having an engineering program which has not been accredited by the Accreditation Board for Engineering and Technology, Inc., unless the student successfully completes the first 12 units of engineering work attempted at this university. At that time, and upon recommendation of the department, unaccredited work will be evaluated for full or partial credit.

General Education

Students will complete a minimum of 50 units in General Education, to include a minimum of nine upper division units taken after attaining junior class standing. No more than twelve units may be used for General Education credit from any one department or academic unit. No more than 7 units from one department can be used in Sections II, III, and IV combined (Foundations, American Institutions, and Explorations).

I. Communication and Critical Thinking: 9 units

1. Oral Communication (3 units)
2. Composition (3 units)
3. Intermediate Composition and Critical Thinking (3 units)

II. Foundations: 29 units

A. Natural Sciences and Quantitative Reasoning (17 units):

1. Physical Sciences (11 units)
Engineering students will take Chemistry 200 which includes a laboratory (5 units).
Physics 195 (3 units)
Physics 196 (3 units)
2. Life Sciences (3 units)
Environmental engineering majors will take Biology 201, 3 units applicable to General Education.
3. Laboratory (satisfied under A.1. above)
4. Mathematics/Quantitative Reasoning
Engineering students will take Mathematics 150, 3 units applicable to General Education

B. Social and Behavioral Sciences (3 units)

C. Humanities (9 units)

Complete three courses in three different areas. One of these courses and the one under IV.A. below must be taken in the same department

III. American Institutions: Three units of the six units of coursework which meet the American Institutions graduation requirement may be used in General Education, excluding courses numbered 500 and above.

- IV. Explorations:** Total: 9 units; must include one course of cultural diversity.
- A. Upper division Humanities (3 units)
Three units must be taken from the same department as one of the Humanities courses selected in Foundations.
 - B. Upper division Humanities (3 units from a department not selected in A above.)
 - C. Upper division Social and Behavioral Sciences (3 units)

Civil engineers are needed in both the private and public sectors. They are employed in the aerospace industry, usually as structural engineers; design and construction of roads, buildings, bridges, airports, dams and other structures; research and teaching at colleges and universities (with an advanced degree); public utilities and transportation; manufacturing; and offshore drilling, environmental pollution, and energy self-sufficiency. New job opportunities in civil engineering will result from growing demands in housing, industrial buildings, power generating plants, and transportation systems.

The Major

Civil engineering is the application of engineering principles to the improvement of the human environment. The civil engineering major prepares students to design and supervise the construction of buildings, dams, roads, harbors, airports, tunnels, and bridges. It also provides training in the planning and construction of the complex systems that supply clean water to cities, remove sewage, control floods, and perform other functions which ensure continued health and safety.

Civil Engineering Major

With the B.S. Degree (Major Code: 09081)

NOTE: See chart below for the recommended sequence of courses for the major in civil engineering.

All students in civil engineering pursue a common program of study in basic engineering and civil engineering fundamentals. In addition, students are provided with the opportunity to select a pattern of study to satisfy their areas of interest. This pattern of study is

CIVIL ENGINEERING MAJOR

FRESHMAN YEAR

<i>Fall Semester</i>	<i>Units</i>	<i>Spring Semester</i>	<i>Units</i>
Chemistry 200, General Chemistry	5	Physics 195, Principles of Physics	3
Engineering 190, Graph. Comm. Virtual Reality ...	2	Mathematics 151, Calculus II	4
Mathematics 150, Calculus I	5	Engineering 120, Engr. Problem Analysis	2
General Education	6	CIV E 160, Stat Methods for CEE	2
	<hr/>	General Education	6
	18		<hr/>
			17

SOPHOMORE YEAR

<i>Fall Semester</i>	<i>Units</i>	<i>Spring Semester</i>	<i>Units</i>
Physics 196, Principles of Physics	3	Physics 197, Principles of Physics	3
Mathematics 252, Calculus III	4	EM 220, Dynamics	3
EM 200, Statics	3	EE 204, Principles of Electrical Engr.	3
ME 260, Intro. to Engineering Materials	3	CIV E 218, Surveying for Civil Engineers	3
General Education	3	General Education	6
	<hr/>		<hr/>
	16		18

JUNIOR YEAR

<i>Fall Semester</i>	<i>Units</i>	<i>Spring Semester</i>	<i>Units</i>
CIV E 301, Intro. to Solid Mechanics	3	EM 340, Fluid Mechanics	3
CIV E 302, Solid Mechanics Lab	1	EM 341, Fluid Mechanics Lab	1
Engineering 280, Methods of Analysis	3	ENV E 355, Environmental Engineering	3
ME 352, Thermo. & Heat Transfer	3	CIV E 253, Geology for Engineers	2
General Education	6	CIV E 321, Structural Analysis I	4
	<hr/>	General Education	6
	16		<hr/>
			19

SENIOR YEAR

<i>Fall Semester</i>	<i>Units</i>	<i>Spring Semester</i>	<i>Units</i>
CIV E 444, Applied Hydraulics	3	CIV E 421, Reinfoc. Concrete Design	3
CIV E 462, Geotechnical Engineering	3	CIV E 495, Civil Engineering Design	3
CIV E 463, Geotechnical Engineering Lab	1	#Professional Electives	9
CIV E 481, Transportation Engineering	3	American Institutions	3
#Professional Electives	5		
American Institutions	3		
	<hr/>		<hr/>
	18		18

Approved as part of the student's master plan.

indicated in the sequence below as “professional electives” and may be selected from available courses in the six study areas (construction, environmental, geotechnical, structural, transportation, or water resources). Computer programming, advanced surveying, engineering economics, and other areas may also be selected. *The students’ choice of elective courses must be made in consultation with their adviser and documented by the filing of an approved master plan during or prior to the first semester of their junior year.*

Upper Division Writing Requirement. Passing the University Writing Examination or completing one of the approved writing courses with a grade of C (2.0) or better.

Professional Electives. Out of the six study areas (construction, environmental, geotechnical, structural, transportation, or water resources), four areas must be represented in the program.

At least two courses must be taken in each of the four selected areas; at least five elective courses must be in the program.

At least seven design units must be accumulated in the elective courses.

Course Requirements.

Construction – Required: None; Elective: Civil Engineering 479, 491, 492.

Environmental – Required: Environmental Engineering 355; Electives: Environmental Engineering 553, 554, 555, 556, 558, 560.

Geotechnical – Required: Civil Engineering 462; Elective: Civil Engineering 465.

Structural – Required: Civil Engineering 321, 421; Electives: Civil Engineering 423, 521, 525.

Transportation – Required: Civil Engineering 481; Electives: Civil Engineering 482, 580.

Water Resources – Required: Civil Engineering 444; Electives: Civil Engineering 445, 530.

Courses (CIV E)

LOWER DIVISION COURSES

160. Statistical Methods for Civil and Environmental Engineers (2)

Prerequisite: Mathematics 141.

Application of statistical methods to civil and environmental engineering problems in construction, hydrology, water quality, air pollution, and other related areas. Students with credit or concurrent registration in the following lower division statistics courses will be awarded a total of four units for the two (or more) courses: Civil Engineering 160; Biology 215; Economics 201; Political Science 201; Psychology 270; Sociology 201; Statistics 119, 250. (Formerly numbered Civil and Environmental Engineering 160.)

218. Surveying for Civil Engineers (3) I, II

Two lectures and three hours of laboratory.

Prerequisites: Civil Engineering 160 and Mathematics 151.

Principles of plane surveying. Measurement of horizontal distance, difference in elevation, and angles. Traverse surveys and computations. Horizontal and vertical curves. Principles of stadia. Topographic surveys. Earthwork. (Formerly numbered Civil and Environmental Engineering 218.)

253. Geology for Engineers (2) I, II

One lecture and three hours of laboratory.

Prerequisite: Civil Engineering 218.

Earth materials, geologic processes, and methods of geologic interpretation of concern to engineers. Open only to students majoring in engineering. (Formerly numbered Civil and Environmental Engineering 253.)

296. Experimental Topics (1-4)

Selected topics. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor’s degree.

UPPER DIVISION COURSES (Intended for Undergraduates)

301. Introduction to Solid Mechanics (3) I, II

Prerequisites: Engineering Mechanics 200 and credit or concurrent registration in Engineering 280 and Engineering Mechanics 220.

Mechanics of solid deformable bodies involving analytical methods for determining strength, stiffness, and stability of load-carrying members. (Formerly numbered Engineering Mechanics 301 and Civil and Environmental Engineering 301.)

302. Solid Mechanics Laboratory (1) I, II

Three hours of laboratory.

Prerequisite: Credit or concurrent registration in Civil Engineering 301.

Laboratory studies in solid mechanics. Experimental stress analysis. Experimental confirmation of theory. (Formerly numbered Engineering Mechanics 302 and Civil and Environmental Engineering 302.)

321. Structural Analysis I (4) I, II

Prerequisite: Civil Engineering 301.

Principles of mechanics applied to analysis of beams, frames, trusses, and three-dimensional frameworks. Graphical methods, influence lines; deflections; introduction to statically indeterminate structures and moment distribution. (Formerly numbered Civil and Environmental Engineering 321.)

335. Computer Aided Drawing and Design (3)

Prerequisite: Engineering 120.

Application of computer aided drafting and design to civil and environmental engineering projects. (Formerly numbered Civil and Environmental Engineering 335.)

421. Reinforced Concrete Design (3) I, II

Prerequisite: Civil Engineering 321.

Properties and characteristics of reinforced concrete; design of structural components. Introduction to plastic theory and limit design. (Formerly numbered Civil and Environmental Engineering 421.)

423. Timber Design (2) I, II

Prerequisites: Civil Engineering 321.

Physical and mechanical properties of wood. Sawn lumber, glulam, plywood. Design of various types of wood structures. Connection design. (Formerly numbered Civil and Environmental Engineering 423.)

444. Applied Hydraulics (3) I, II

Prerequisite: Engineering Mechanics 340. **Proof of completion of prerequisite required:** Copy of transcript.

Open channel and pressure conduit flow, pumps and turbines, hydroelectric power, and water law. (Formerly numbered Civil and Environmental Engineering 444.)

445. Applied Hydrology (3) II

Prerequisite: Civil Engineering 444.

Basic hydrologic principles, hydrologic measurements, small and midsize catchment hydrology, frequency analysis, regional analysis, reservoir, stream channel and catchment routing, hydrologic design. (Formerly numbered Civil and Environmental Engineering 445.)

462. Geotechnical Engineering (3) I, II

Prerequisites: Civil Engineering 253; Civil Engineering 301, credit or concurrent registration in Engineering Mechanics 340, and concurrent registration in Civil Engineering 463. **Proof of completion of prerequisite required:** Copy of transcript or enrollment confirmation.

Mechanics of soils as they apply to engineering problems, soil classification, compaction, swelling, consolidation, strength and permeability. Applications to geotechnical and environmental engineering problems. (Formerly numbered Civil and Environmental Engineering 462.)

463. Geotechnical Engineering Laboratory (1) I, II

Three hours of laboratory.

Prerequisite: Concurrent registration in Civil Engineering 462.

Proof of completion of prerequisite required: Copy of transcript or enrollment confirmation.

Laboratory procedures of soil testing for geotechnical and environmental engineering problems. (Formerly numbered Civil and Environmental Engineering 463.)

465. Foundation Engineering and Earth Retaining Structures (3) II

Prerequisites: Civil Engineering 462 and 463.

Soil mechanics theories applied to design of shallow and deep foundations; lateral pressure of soils, design of retaining walls. (Formerly numbered Civil and Environmental Engineering 465.)

479. Construction Materials (3) II

Two lectures and three hours of laboratory.

Prerequisites: Civil Engineering 462 and 481.

Selection, design and control of mixes of portland cement and asphalt concrete. Properties of these and other materials used in construction. (Formerly numbered Civil and Environmental Engineering 479.)

481. Transportation Engineering (3) I, II

Prerequisites: Civil Engineering 218 and Engineering 120.

Physical design of transportation facilities, traffic analysis and control for different modes, planning and demand analysis, introduction to environmental impacts of transportation systems and intelligent transportation systems. (Formerly numbered Civil and Environmental Engineering 481.)

482. Highway Engineering (3) I, II

Two lectures and three hours of laboratory.

Prerequisite: Civil Engineering 481.

Highway design, facility sizing, geometric design, drainage, earthwork, pavement design, traffic control devices, safety and environmental considerations. (Formerly numbered Civil and Environmental Engineering 482.)

491. Construction Methods (3) I

Prerequisite: Civil Engineering 321.

Components and methods of construction including earthwork; foundations; wood, steel, and concrete construction; roofing and cladding; interior construction. (Formerly numbered Civil and Environmental Engineering 491.)

492. Construction Engineering (3) II

Prerequisites: Civil Engineering 491 and Engineering 430.

Project oriented. Cost estimating; alternative cost-saving changes; critical path scheduling. (Formerly numbered Civil and Environmental Engineering 492.)

495. Civil Engineering Design (3) I, II

One lecture and six hours of laboratory.

Prerequisites: Credit or concurrent registration in Civil Engineering 321, 421, 444, 462, 481, and Environmental Engineering 355. At least three of these courses must be completed prior to enrolling in this course.

Application of engineering principles and design techniques to the design of civil engineering projects. (Formerly numbered Civil and Environmental Engineering 495.)

496. Advanced Civil Engineering Topics (1-3) I, II

Prerequisites: Minimum grade point average of 3.0 and consent of instructor.

Modern developments in civil engineering. See Class Schedule for specific content. Maximum credit six units for any combination of Civil Engineering 496, 499 and 596.

499. Special Study (1-3) Cr/NC I, II

Prerequisites: Minimum grade point average of 3.0 and consent of instructor.

Individual study in the area of civil engineering. Maximum credit six units for any combination of Civil Engineering 496, 499 and 596.

UPPER DIVISION COURSES (Also Acceptable for Advanced Degrees)

521. Structural Analysis II (3) I

Prerequisite: Civil Engineering 321.

Analysis of statically indeterminate structures by virtual work. Advanced treatment of slope deflection, moment distribution. Arch analysis, secondary stresses in trusses. Advanced treatment of influence lines. Introduction to matrix analysis of structures. (Formerly numbered Civil and Environmental Engineering 521.)

525. Design of Steel Structures (3) I, II

Prerequisite: Civil Engineering 321.

Mechanical behavior of structural steel. Design of steel beams, girders, columns and members subjected to combined stresses. Design of various types of connections of steel structures; plate girders, continuous beams and rigid frames. (Formerly numbered Civil and Environmental Engineering 525.)

528. Masonry Structures Design (3) I

Prerequisites: Civil Engineering 301 and 321.

Analysis and design of masonry beams, retaining walls, shear walls, bearing walls, and columns. Use of allowable stress and strength design methods. Design project, including structural system analysis and lateral design of masonry buildings.

530. Open Channel Hydraulics (3) I, II

Prerequisite: Civil Engineering 444. **Proof of completion of prerequisite required:** Copy of transcript.

Principles of open channel flow; analysis and problems of critical, uniform, gradually-varied, and rapidly-varied flows, design and environmental problems; computer simulations and applications; and culvert hydraulics. (Formerly numbered Civil and Environmental Engineering 530.)

580. Traffic Engineering Design (3)

Prerequisite: Civil Engineering 481.

Sizing and configuration of highway facilities based on capacity analysis. Traffic signal design, impact and mitigation studies, parking, safety design. (Formerly numbered Civil and Environmental Engineering 580.)

596. Advanced Civil Engineering Topics (1-3) I, II

Prerequisites: Minimum grade point average of 3.0 and consent of instructor.

Modern developments in civil engineering. See Class Schedule for specific content. Maximum credit of six units for any combination of Civil Engineering 496, 499 and 596 applicable to a bachelor's degree. Maximum combined credit of six units of Civil Engineering 596 and 696 applicable to a 30-unit master's degree.

GRADUATE COURSES Refer to Bulletin of the Graduate Division.

For additional courses which are electives in the civil engineering program, refer to "Environmental Engineering" in this section of the catalog.